

Name:

Student id:

Section Serial#:

QUESTION #	1	2	3	4	TOTAL
MAX POINTS	20	20	20	24	
POINTS EARNED	19	19.5	16	23.5	78

UNIVERSITY OF BAHRAIN

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

TIME: 90 MINUTES

ITCS242: ASSEMBLY LANGUAGE PROGRAMMING

SECOND TEST

DATE: MAY 21, 2013

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## QUESTION ONE:

{20 pts}

- 1) Write the needed instructions to store in AL and AH the counts of ONE and ZERO bits in a predefined memory location X of size double word. Keep the value in X unchanged.

mov ax, 0

mov ecx, 32

CLC?

LF: ROL X, 1

Jc L1 ; jump if carry = 1

inc AH

jmp L2

L1: inc AL

L2: Loop LF

DRAGON

- 2) Given: k dword ? ; where k is an integer value between 4 and 16; Write the needed instructions to draw a triangle of letters consisting of K rows as shown below. For K=6 a triangle is:

mov esi, 1

A

mov edi, 0

AB

mov ecx, k

ABC

LF: push ecx

ABCD

mov ecx, esi

ABCDE

LM: mov AL, 'A' + ~~edi~~

ABCDEF

CALL writeChar

inc edi

Loop LM

pop ecx

mov edi, 0 ??

CALL crlf

inc esi

Loop LF



**QUESTION TWO: Write a sequence of assembly instructions to perform each of the following tasks:**

- 1) Give no more than 5 instructions to inverse even-numbered bits in **eflags** register. Keep other bits unchanged. {5 pts}

4.5  
 push 7Fd  
 pop eax  
 xor eax, 55555555h  
 push eax  
 pop 7Fd

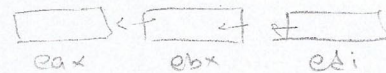
3 2 1 0  
 0 1 0 1  
 555

- 2) Give no more than 3 instructions to inverse all bits in the last **dword** pushed onto the stack. {3 pts}

3  
 pop eax  
 xor eax, 0FFFFFFFh  
 push eax

- 3) Give no more than 5 instructions to shift the entire value in **EAX:EBX:EDI** 8 bits to the left. {5 pts}

5  
 mov ecx, 8  
 lodsb edi, 1  
 RCL ebx, 1  
 RCL eax, 1  
 Loop 20

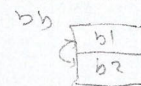


- 4) Give no more than 3 instructions to divide the signed predefined words values U9 / U8 {3 pts}

3  
 mov ax, U9  
 CWD  
 Div U8

- 5) Give no more than 4 instructions to store in **bb** the product of multiplying the 2 bytes of **bb**. {4 pts}

4  
 mov AL, byte ptr bb  
 mul byte ptr bb+1  
 mov bb, ax





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**QUESTION THREE:** What will be in the specified registers after executing the following code? { 20 pts}

a) MOV AX, 6C50H  
 MOV BX, 0EC4FH  
 IMUL BH

AX = ~~EE40~~ H

c) MOV AX, 0B9A5H  
 TEST AX, 0EC79H  
 XOR AX, 0AD7AH

AX = ~~140F~~ H

e) MOV AX, 3AFBH  
 MOV BX, 7A36H  
 AND AX, BX  
 ROL AX, 8  
 RCR BX, 1

AX = ~~323A~~ H

BX = ~~3D1B~~ H

g) MOV AX, 3FFFH  
 MOV BX, 6940H  
 CMP AL, AH  
 JL L1 F  
 INC BL  
 JMP L2  
 L1: INC BH  
 L2:

BX = ~~6940~~ H

b) MOV AX, 2A49H  
 MOV CX, 2090H  
 IDIV CL

AX = ~~49A0~~ H

d) MOV BX, 794CH  
 MOV AX, 2F08H  
 SHRD AX, BX, 4

AX = ~~C2F0~~ H

f) MOV AX, 4E79H  
 MOV BX, 7A36H  
 MOV CL, 2  
 SAR AX, CL  
 NEG BX

AX = ~~239E~~ H

BX = ~~85CA~~ H

h) MOV AX, 3FFFH  
 MOV BX, 5A2DH  
 CMP AL, AH  
 JB L3 T  
 DEC BL  
 JMP L4  
 L3: DEC BH  
 L4:

BX = ~~592D~~ H



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**QUESTION FOUR:** Write an Assembly program that defines in the data segment three arrays UU, GG, and RR each consisting of 24 values. The types of UU and GG are signed bytes with values randomly generated in procedure **tasks**. The program consists of two procedures described as follows: {24 pts}

- a) The first procedure named **FUN** accepts 3 parameters:  $x, y$  (variables of type signed byte) and  $f$  is a pointer to a variable. The purpose of the procedure **FUN** is to calculate the value of  $f$  as follows:  
 $f = 32[(x * y)/(x + y)]$ . (Define a function **FUN** in a form that allows using **invoke**).
- b) The second procedure named **tasks** performs the following:
- 1) Randomly generates 24 values (-20 ... +20) and store them in array UU.
  - 2) Randomly generates 24 values (-30 ... +65) and store them in array GG.
  - 3) Calls the procedure **FUN** to calculate the value of  $RR[j] = f(UU[j], GG[j])$  for the corresponding values of  $UU[j]$  and  $GG[j]$ .

Include Irvine32.inc

.data

UU byte 24 dup(?)

GG byte 24 dup(?)

RR dword 24 dup(?)

.code

FUN proc uses eax ebx ecx edx, x: byte, y: byte, f: ptr dword

mov AL, x

imul y ; Ax = x \* y

movsx bx, x

movsx dx, y

add bx, dx ; bx = x + y

cwd ; Ax → dx:Ax

idiv bx ; ax = (x \* y) / (x + y)

movsx eax, ax

SHL eax, 5 ; result = eax

mov ebx, f

mov [ebx], eax

ret

FUN endp

tasks proc

CALL Randomize

mov esi, 0

mov ecx, lengthof UU

L1: mov eax, 0

CALL RandomRange

sub eax, 20

mov UU[esi], AL

mov eax, 96

CALL RandomRange

sub eax, 30

mov GG[esi], AL

inc esi

Loop LN

mov edi, 0

mov esi, 0

mov ecx, lengthof RR

L2:

LN:

invoke FUN, UU[esi], GG[esi],  
addr RR[edi]

inc esi

add edi, 4

Loop LN

Exit

tasks endp

end tasks.